

THE BUTTERFLIES (PAPILIONOIDEA, HESPERIOIDEA) OF THE GALÁPAGOS ISLANDS, ECUADOR: DISTRIBUTION, HOSTPLANTS AND BIOLOGY.

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ABSTRACT. The butterfly fauna of the Galápagos islands is reviewed. Ten species are recorded from the Archipelago. *Leptotes parrahioides* (Wallengren), *Urbanus dorantes galapagensis* (Williams), and *Agraulis vanillae galapagensis* (Holland) are endemic and the others are Neotropical faunal elements. A number of new island and host plant records are given.

Additional key words: flower visitation, phenology, Neotropical region.

The butterfly fauna of the Galápagos Islands was first discussed by Williams (1911). Six species were then recorded from the archipelago. Previous reports of Galápagos butterflies were published by Wallengren (1860, 1861), Butler (1877) and Holland (1889). Subsequent to Williams' revision, little mention was made of the butterflies in the Galápagos until Beebe (1923) and Parkin et al. (1972) added two species of milkweed butterflies, *Danaus plexippus* (Linnaeus) and *Danaus gilippus* (Cramer), to the fauna. A literature-based checklist of the insects of Galápagos by Linsley and Usinger (1966) and Linsley (1977) listed eight species and indicated on which island each species occurred. During the last 33 years only two faunistic notes have been published. Onore and Mielke (1988) reported *Calpodus ethlius* (Stoll) and Roque et al. (1997) added *Hemiargus ramon* (Dognin). Additional information such as flower visits and host plant records were given by Linsley (1966), McMullen (1986, 1990, 1993), McMullen and Viderman (1994) and Roque (1998a, b). Finally, Peck et al. (1998) listed the introduced insect species that occur on the archipelago and included *C. ethlius* and *H. ramon*.

This paper reports new information on Galápagos butterflies gathered during 8 years of fieldwork on the Islands. The butterfly fauna of the archipelago includes 10 species and subspecies, three of which are presumed to be endemic.

MATERIALS AND METHODS

From November 1994 to June 2002 the author conducted daytime observations and collections of butterflies in the Galápagos Islands. A total of 387 specimens were sampled and identified, and observations on habitat associations and behavior of each species was noted. The methods included: a) field collections with a light mesh net, b) field observations of adult behavior and visits to food sources, c) collecting and rearing of immature stages.

Immatures were collected and reared in the laboratory. Eggs and larvae were reared in plastic bags at room

temperature under the natural day-night photoperiod regime. Fresh leaves were provided at least every other day. Pupae were kept moist until adults hatched.

The majority of this material was deposited in the Invertebrates Collection of the Charles Darwin Research Station (CDRS), Santa Cruz Island, Galápagos Islands. Some of the other specimens are in the following collections: Pontificia Universidad Católica del Ecuador (PUCE), Quito, Ecuador; Museo Ecuatoriano de Ciencias Naturales (MECN), Quito, Ecuador and California Academy of Sciences (CAS), San Francisco, USA. Additional records of distributions were obtained from the literature and unpublished data from Dr Bernard Landry, whose material is deposited in the Canadian National Collection (CNC), Ottawa, Canada.

The classification adopted here follows Ackery and Vane-Wright (1984) and Ackery et al. (1999). A brief description is given for the immature stages of the endemic species. The nomenclature of the plants follows McMullen (1999).

The following abbreviations were used: FW = fore wings, DFW = dorsal fore wings, VFW = ventral fore wings. HW = hind wings, DHW = dorsal hind wings, VHW = ventral hind wings. DW = dorsal side of the wings, VW = ventral side of the wings. The size of the butterflies in mm refers to their fore wing length.

RESULTS

Doubtful Records

Previous authors reported several species whose occurrence in the Galápagos has not been demonstrated convincingly. It is better to exclude these as probable misidentifications or mislabelling as is explained below.

Actinote sp. (Nymphalidae): Daniel Fitter, a naturalist guide with the Galápagos National Park Service, sent a color photograph to the author for examination. The photograph, taken on Media Luna, Santa Cruz Island, was published in Fitter et al. (2001:115) and was

identified as *Actinote* sp. (Nymphalidae). It has not been collected or seen in the archipelago since the picture was taken. The establishment in the Galápagos of this species will be only confirmed or refuted when additional material is found.

Hypolimnna misippus (Linné), (Nymphalinae): The only notice of the occurrence of this species in the archipelago is from one specimen deposited in the American Museum of Natural History, New York. The specimen has the following label data: "Conway Bay, Indefatigable Is, Galapagos, March 15 1935, Crocker Exped". It is likely that this is a mislabelling or if the record is valid it was a migrant individual. The species has never been seen or collected since.

Agraulis vanillae lucina (C. & R. Felder): This species was reported by Moreno et al. (1997). It is likely a misidentification of the Galápagos's endemic subspecies *Agraulis vanillae galapagensis* (Holland, 1889).

Heteroptia sp. (Hesperiidae): One male from Albe-Marle [Isabela] was reported by Van Duzee (1933), although the author suggested that the specimen had been mislabeled and collected in Mexico.

Erynnis funeralis (Scudder & Burgess), (Hesperiidae): One specimen (as *Thanos persius* (Scudder)) deposited in the CAS is said to have been collected in Chatham [San Cristóbal], 15 IV 1932 by M Willows Jr. However, Van Duzee (1933) suggested the specimen was mislabelled.

Leptotes trigemmatius (Butler), (Lycaenidae): Larsen (1991) mentioned this species from the Galápagos Islands but it is likely a misidentification of the sister taxon *Leptotes parrhasioides* (Wallengren), as noted by Balint and Johnson (1995).

Phoebis agarithe (Boisduval) (Pieridae): Moreno et al. (1997) reported this species from the archipelago. These authors probably misidentified *Phoebis scannae marcellina* (Cramer) as this species which is superficially similar in size and color. *P. agarithe* has never been collected on the Galápagos Islands.

SPECIES ACCOUNTS

HESPERIIDAE

Pyrginae

Urbanus dorantes galapagensis (Williams 1911)

"Galápagos Skipper"

(Fig. 1)

Eudamus galapagensis Williams 1911:303; Draudt 1921:853; Beebe 1923:55; Van Duzee 1933:144.

Urbanus dorantes galapagensis; Evans 1952:93; Linsley & Usinger 1966:157; Parkin et al. 1972:103.

Urbanus galapagensis Williams & Hayward 1944:93.

Diagnosis. FW = 15–20 mm. This is the only tailed skipper of the archipelago. FW dark brown with

translucent spots and a pattern of lilac and brown bands in VHW. In some specimens, the hyaline spots are smaller. The lilac bands on the VW tend to be pale with lighter brown or yellowish scales. The sexes are similar, but males have coastal folds.

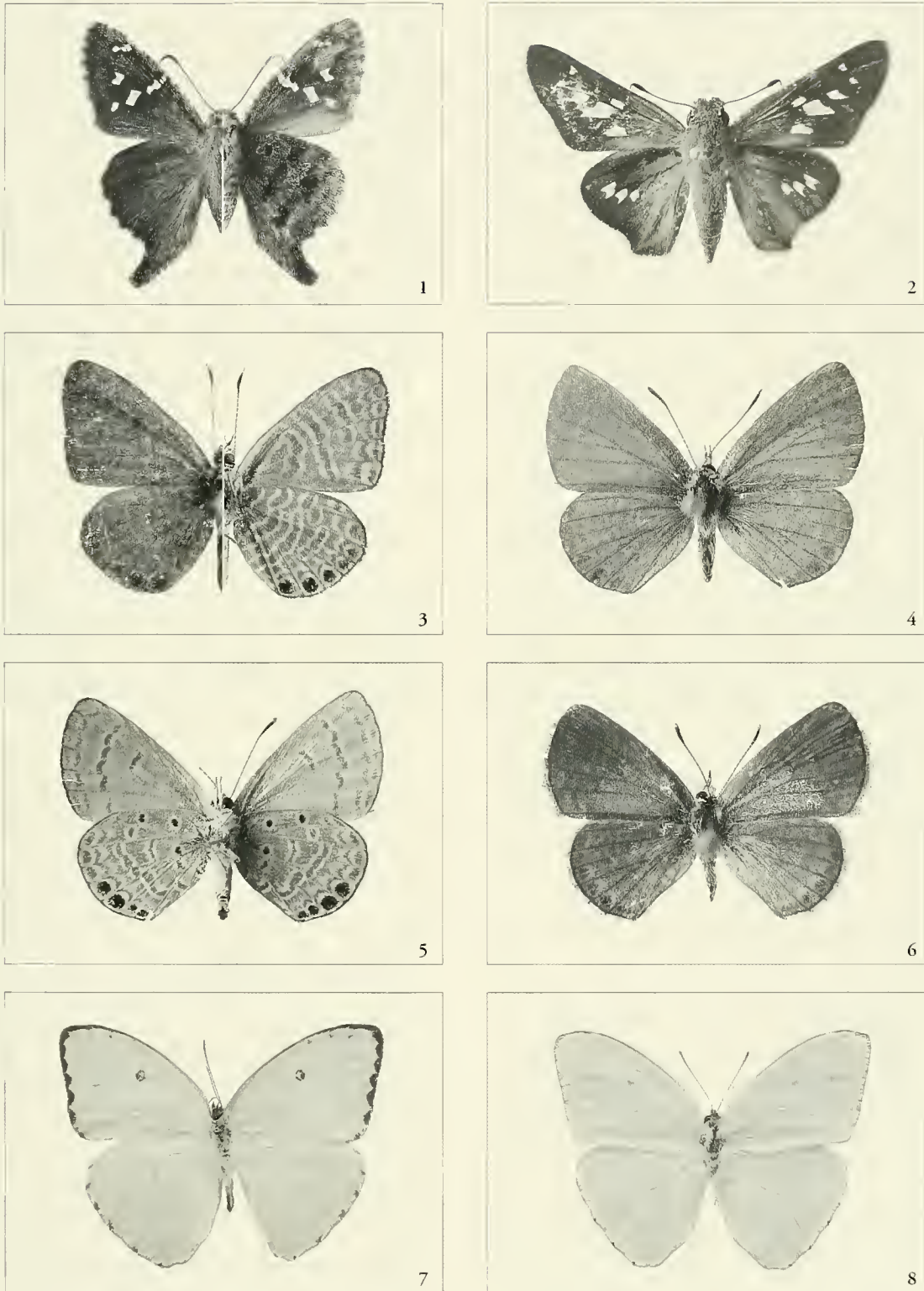
Geographical distribution. Reported from Baltra, Edén, Española, Floreana, Genovesa, Isabela, Pinzón, San Cristóbal, Santa Cruz and Santiago (Linsley & Usinger 1966). Additional records include: Fernandina, Pinta and Rábida.

Natural history. Adults were common in open areas, roadsides, and forests from sea level to the highest elevations. The flight is erratic and low to the ground. Both sexes were seen visiting flowers. Oviposition was observed on leaves and flower buds of various Leguminosae. Eggs greenish laid singly on *Phaseolus atropurpureus* D.C., *P. mollis* Hook, *Desmodium incanum* DC and *Galactia striata* (Jacq). Caterpillar green with the head and prothoracic shield black. In the last instar the body is brown. Pupa pale brown speckled with darker brown.

Flowers visited. Acanthaceae: *Justicia galapagana* Lindau; Asteraceae: *Darwiniothamnus tenuifolius* (Hook. f.) Harling, *Scalesia cordata* Stewart, *Scalesia microcephala* Robins, *Scalesia villosa* Stewart, *Scalesia retroflexa* Hemsley; Boraginaceae: *Cordia leucophlyctis* Hook, *C. lutea* Lam.; Convolvulaceae: *Merremia acgyptica* (L.) Urban, Leguminosae: *Acacia insulaeiacobi* Riley, *P. mollis*; Malvaceae: *Sida rhombifolia* L.; Plumbaginaceae: *Plumbago scandens* L.; Rubiaceae: *Diodia radula* Cham. & Schlecht; Rutaceae: *Citrus limon* (L.) Burn; Solanaceae: *Lycopersicon chesmanii* Riley, *Physalis pubescens* L.; Sterculiaceae: *Waltheria ovata* Cav.; Verbenaceae: *Lantana camara* L., *Lantana peduncularis* Anderss, and *Lippia strigilosa* Mart & Gal.

Flight period. Multivoltine with a peak in January and February.

Remarks. The holotype is in the California Academy of Sciences, San Francisco, USA (CAS); it bears the following label information: Galapagos Is, Chatham I. [San Cristóbal], X 15 06, Coll. By F. X. Williams, California Academy of Sciences Type No. 3209. A specimen deposited on CAS has the following label information: Puerto Vallarta, Jalisco, Mexico, VIII 21 32, M Willow Jr coll, Exp 1932. This could be a mislabelling. Evans (1952) treated it as a subspecies of *Urbanus dorantes* (Stoll, 1790) compared to *Urbanus dorantes santiago* (Lucas, 1856) from Cuba and *U. dorantes dorantes* from mainland Ecuador; *U. dorantes galapagensis* is smaller and has shorter hindwing tails. The male valve is much less dentate and the arms of harpe have few spines. The genus *Urbanus* Hübner 1807, is used provisionally here until revisionary work is undertaken. According to S.



FIGS. 1-8. Galápagos butterflies species. 1, *Urbanus galapagensis* (DW and VW); 2, *Calpodus ethlius* (DW); 3, Male of *Leptotes parrhasioides* (DW and VW); 4, Male of *Hemiargus ramon* (DW); 5, Male of *Hemiargus ramon* (VW); 6, Female of *Hemiargus ramon* (DW); 7, Female of *Phoebis sennae marcellina* (DW); 8, Male of *Phoebis sennae marcellina* (DW).

Steinhauser (pers. com.) the species may belong in a separate, undescribed genus.

Material studied. (70♂ and 16♀). ECUADOR, Galápagos. ESPAÑOLA: Hood, 15 V 1999, [R. E. Snodgrass, E. Heller] (CAS) (1♂). Bahía Manzanillo, 24 IV 1992, B. L. [andry] (CNC), (2♂). FERNANDINA: 1 IX 1966, (CDRS) (1♂), Cueva Norte, Arid zone, 20 VI 1995, L. R. [oque] (CDRS) (1♂). FLOREANA: Arid zone, 130 m, 17 IV 1996, L. R. (CDRS) (5♂ and 3♀). Cerro Pajas, *Scalesia* forest, 320 m, 18 IV 1996, L. R. (CDRS) (6♂). Cerro Pajas 520 m, 19 IV 1996, L. R. (CDRS) (9♂). Charles, 5 X 1999, [R. E. Snodgrass, E. Heller] (CAS) (5♂). ISABELA: Tagus Cove, III 1906, Alotype, F. X. Williams] (CAS) (1♀). Cowley Mt. VIII 1906, F. X. W. (CAS) (3♂). Albemarle, 27 IV 1932, M. Willows (CAS) (1♂); 25 IV 1932, M. Willows (CAS) (1♀). Albemarle, 12 VI 1999, [R. E. Snodgrass, E. Heller] (CAS) (1♀). Albemarle Iguana Cove, 21 V 1932, M. Willows (CAS) (2♀). V[olcán] A[leedo] 500 m., 2 IV 1996, L. R. (CDRS) (5♂ 2♀). V[Sierra] N[egra], 2 III 1989, S. B. Peck (CNC) (1♂). VSN, 6 IV 1996, L. R. (CDRS) (1♂ 1♀). VSN, Las Mercedes 120m, 24 IV 1996, L. R. (CDRS) (1♂ 7♀). Sierra Negra pampas ferns zone, 24 IV 1996, L. R. (CDRS) (1♀). Santo Tomás, 20 III 1995, P. Delgado (CDRS) (3♂); 6 IV 1996, L. R. (CDRS) (2♂); 23 IV 1996, L. R. (CDRS) (1♂); 23 IV 1996, (CDRS) (1♂). V[olcán] 1200 m, 19 IV 1996 (CDRS) (7♂ 4♀). Playa Tortuga Negra, 22 VI 1995, L. R. (CDRS) (1♂). PINTA: Abingdon, 24 VI 1899, [R. E. Snodgrass, E. Heller], (CAS) (1♂). PINZON: Playa escondida, 20 IV 2002, L. R. & B. Landry (CDRS) (2♂ 3♀). RABIDA: Sendero turístico, 13 III 1998, L. R., (CDRS) (1♂). SANTA CRUZ: Horne-man farm 220m, 18 III 1964, (1♂); 3 V 1964, (2♀), D. Q. Cavagnaro, (CAS). Puerto Ayora, 17 I 1989, B. L. (CNC) (1♂); 5 XI 1995, A. Herrera (CDRS) (1♂); 29 X 1995, L. R. V. Cruz (CDRS) (1♂). 4 km N Puerto Ayora, 20 I 1989, B. L. (MECN) (1♂). Tortuga Reserve W Santa Rosa, 6 V 1989, S. B. Peck (CNC) (1♂); 6 II 1989, B. Landry (CDRS) (1♂). Cerro Crocker, 9 II 1996, L. R. (CDRS) (1♂), Bellavista, 13 II 1999, reared from leaves *D. canum*, L. R. (CDRS) (4♂ 1♀); Punta Nuñez, 29 VII 2002, R. Boada (CDRS) (1♀). SAN CRISTOBAL: Chatam, X 1905, F. X. W., (CAS) (3♂); 1 X 1906, Holotype, F. X. W. (CAS) (1♂); 23 V 1899, [R. E. Snodgrass, E. Heller], (CAS) (6♂ 1♀); 15 IV 1932, (3♂); 17 IV 1932, (1♂); 15 IV 1932, (2♂), M. Willows, (CAS). Puerto Baquerizo, 17 II 1989, S. B. Peck (CNC) (1♂). Airport 30 m, 6 III 1996, L. R. (CDRS) (6♂ 2♀). SANTIAGO: James, 21 IV 1899, [R. E. Snodgrass, E. Heller], (CAS) (2♀). Central 700 m, 9 IV 1992, B. L. (CNC) (1♂).

Hesperiinae

Calpodus ethlius (Stoll, 1782) "Canna Skipper" (Fig. 2)

Papilio ethlius Stoll 1782:212.

Calpodus ethlius; Onore & Mielke 1988:619; Peck et al. 1998:227.

Diagnosis. FW = 19.5–24 mm. The Canna Skipper is a large brown species with translucent spots on the wings. Diagnostic features include a linear row of four spots on the HW and the absence of a tail. Specimens collected in the Galápagos are similar in shape and size to mainland specimens.

Geographical distribution. This species is widely distributed from Florida to Argentina including the West Indies. In the Galápagos Islands it has been reported previously from Isabela (Onore & Mielke 1988) and here from Santa Cruz Island.

Natural history. *Calpodus ethlius* is a powerful flyer that is most active at dawn and dusk, but is also seen at other times of the day. The species is most

abundant in urban areas and gardens but it has the ability to find isolated hosts inside the forests. Eggs are pale green and laid singly on the leaves of *Canna edulis* Kerr and *Canna lutea* Mill (Cannaceae), which have been introduced to the Archipelago.

Flowers visited. Verbenaceae: *Clerodendrum molle* HBK.

Flight period. Specimens have been collected in February, April, May and July.

Remarks. Peck et al. (1998) listed this large skipper as recently introduced in the archipelago, and it is a known migrant (Ferguson et al. 1991).

Material studied. (5♂ and 1♀). ECUADOR, Galápagos. ISABELA: VSN, 1 km W Santo Tomás, 12 V 1996, ex larvae, L. R. (CDRS) (1♂). SANTA CRUZ: Road to Baltra, 11 VI 1981, Y. Lubin, (CDRS) (1♂). Puerto Ayora, 24 VII 1996, (CDRS) (3♂); 15 II 1998, (CDRS) (1♀); 22 IV 1998, L. R. (CDRS) (1♂)

PIERIDAE

Coliadinae

Phoebis sennae marcellina (Cramer, 1779)

"Sulfur Butterfly"

(Figs. 7, 8)

Papilio marcellina Cramer 1779:103.

Callibryas eubele; Holland 1889:195; Williams 1911:296; Beebe 1923:55.

Catopsila eubele; Van Duzee 1933:140.

Phoebis sennae; Linsley & Usinger 1966:156; Parkin et al. 1972:103.

Phoebis sennae marcellina; Moreno et al. 1997:146.

Diagnosis. FW = 24–36 mm. Easily recognized, it is the only yellow butterfly on the Galápagos Islands. Male: bright yellow. Female: yellow with black spots along the outer margins of the wings and a black spot with a pale center at the end of the forewing cell above. Galápagos populations are very variable in color pattern and size, but are identical with mainland specimens in genitalic features.

Geographical distribution. *Phoebis sennae marcellina* flies from México to Uruguay (D'Abrera 1981). In the Galápagos Islands the species has been previously reported from Baltra, Daphne, Edén, Fernandina, Floreana, Isabela, Pinta, Santiago, San Cristóbal, and Santa Cruz (Linsley & Usinger 1966) and is here reported from Marchena.

Natural history. One of the most common species on the Galápagos Islands. Adults occur in open habitats such as beaches, dry forests and roadsides from sea level to 900 m. Both sexes have been observed visiting flowers and puddles. The flight is fast and erratic. Beebe (1924) reported a southeast migration of this species from Santiago and Isabela to Santa Cruz, and individuals have been observed commonly flying between islands. Williams (1911) reported *Senna picta* G. Don as a host plant in Galápagos. Females have

been observed laying eggs in *Senna tora* L., *Senna bicapsularis* L., and *Senna occidentalis* L. (Fabaceae).

Flowers visited. Acanthaceae: *J. galapagana*; Apocynaceae: *Catharanthus roseus* (L.) G. Don; Asteraceae: *Bidens pilosa* L.; Boraginaceae: *C. leucophlyctis*, *C. lutea*, *Heliotropium angiospermum* Murr., *Tournefortia rufo-sericea* Hook. f.; Cactaceae: *Opuntia insularis* Stewart; Convolvulaceae: *Ipomoea pes-caprae* (L.) R. Br., *Ipomoea nil* (L.) Roth; Leguminosae: *S. picta*; Malvaceae: *Gossypium barbadense* var. *darwinii* (Watt.) Hutch, *Hibiscus rosa-sinensis* L., *S. rhombifolia*; Nyctaginaceae: *Bougainvillea spectabilis* Willd, Plumbaginaceae: *P. scandens*; Rubiaceae: *D. radula*; Verbenaceae: *L. camara*, *Verbena litoralis* HBK.

Flight period. Multivoltine. Specimens have been seen throughout the year.

Material studied. (32♂ and 10♀). ECUADOR, Galápagos. FERNANDINA: Cabo Douglas, 15 IV 1999, P. Polo (CDRS) (1♂). ISABELA: VA, Pega-pega, 6 IV 1999, L. R[oque] (CDRS) (1♂). Puerto Villamil, 2 III 1989, B. L[andry] (CNC) (1♂). Arid Zone, 7 III-1989, S. B. Peck (CNC) (1♂). VSN, 6 IV 1996, L. R (CDRS) (5♂ and 2♀). VSN, Santo Tomás 300 m, 26 IV 1996, L. R (CDRS) (8♂). VSN, Pampas, 24 IV 1996, L. R (CDRS) (1♂ and 3♀). VSN, La Bocanilla 1000 m, 25 IV 1996, L. R (CDRS) (2♂). VSN, Alemania 350 m, 29 IV 1996, L. R (CDRS) (2♂). Playa Tortuga Negra, 22 VI 1995, L. R (CDRS) (3♂). MARCHENA: Playa Negra, 30 IV 2000, L. R. (CDRS) (1♂). SAN CRISTÓBAL: Puerto Baquerizo, 17 II 1989, B. L. (CDRS) (2♂); El Porvenir, 15 III 1996, L. R (CDRS) (1♂ and 5♀). SANTA CRUZ: Santa Cruz, 5 VIII 1990, C.K McMullen (CDRS) (1♂). SANTIAGO: Los Jabonillos, XII 1974, (CDRS) (1♂); Espumilla, 17 III 1995, L. R (CDRS) (1♂).

LYCAENIDAE

Polyommatainae

Leptotes parrhasioides (Wallengren 1860)

“Galápagos Blue Butterfly”

(Fig. 3)

Lycaena parrhasioides Wallengren 1860:37; 1861:355.

Cupido parrhasioides; Williams 1911:300, Beebe 1923:55; Van Duzee 1933:143; Moreno et al. 1997:155.

Leptotes parrhasioides; Bridges 1958:1 268, Linsley & Usinger 1966:157; Balint & Jonhson 1995:9.

Diagnosis. This species and the following are the only lycaenid butterflies in the Galápagos Islands. Both are similar, but the wing pattern and genitalia are distinctive. FW = 8–12.5 mm. Male: DFW and DHW violet blue with two or three black anal spots. VW ground color grayish with a pattern of white markings. VHW with three or four marginal spots, black in the middle, and filled with metallic blue. Female: similar to male but DW ground brown or blue.

Geographical distribution. Endemic to the Galápagos Islands, and reported from the islands of Baltra, Edén, Española, Fernandina, Floreana, Isabela, Pinzón, San Cristóbal, Santa Cruz, Santiago (Linsley & Usinger 1966). It is reported here from Marchena, Pinta and Rábida.

Natural history. Common in the arid zone of the islands. The flight is slow and close to the ground, but may also be rapid and erratic. Both sexes have been seen visiting flowers and were often observed on muddy puddles early in the morning or after rainfall. The pale green eggs are laid singly on the flowers, young fruits, or young leaves of host plants. Williams (1911) reported *Cardiospermum halicacabum* L. as a host plant and indicated *Cardiospermum galapageium* B. L. Rob. & Greenm (Sapindaceae) as another probable food plant. New hostplants records include: *P. scandens*, *Crotalaria incana* L. and *Rhynchosia minima* (L.) DC. (Leguminosae). The larvae are variable, either green or red with a pattern of dark dorsal marks, depending on the host. The body is covered by short white hairs. Pupae are greenish with brown markings.

Flowers visited. Acanthaceae: *J. galapagana*; Asteraceae: *Darwiniothamnus lancifolius* (Hook. f.) Harling; Boraginaceae: *H. curassavicum*, *Tournefortia psilostachya* HBK, *T. rufo-sericea*; Cucurbitaceae: *Momordica charantia* L.; Cyperaceae: *Cyperus ligularis* L.; Leguminosae: *Vigna luteola* (Jacq.) Benth.; Linaceae: *Linum cratericola* Eliass; Lythraceae: *Cuphea racemosa* (L. f.) Spreng.; Malvaceae: *S. rhombifolia*, Plumbaginaceae: *P. scandens*; Nyctaginaceae: *Commicarpus tuberosus* (Lam.) Standl.; Solanaceae: *L. cheesmanii*; Zygophyllaceae: *Tribulus cistoides* L.

Flight period. The species is multivoltine.

Remarks. Wallengren (1860) described this endemic species from at least one male and one female [locality not specified] collected in May 1852 on the Galápagos. However, in 1861 Wallengren redescribed the species with additional material labelled “Puna” [gulf of Guayaquil] and “San Jose island” [Panamá]. Balint and Jonhson (1995) studied a specimen labeled “type” in the Naturhistoriska Riksmuseet, Stockholm, Sweden (NRS). They stated that this specimen belongs to the sister species *Leptotes trigemmatum* (Butler) and that the specimens involved in the redescription (Wallengren 1861) were incorrectly associated with the original series from the Galápagos. The real type of *L. parrhasioides* was not examined, although it is probably located in NRS.

Material studied. (52♂ and 12♀). ECUADOR Galápagos. ESPAÑOLA: Bahía Manzanillo, 25 IV 1992, B. L (CNC) (1♂). FERNANDINA: Narborough, 16 IV 1906, F X W [Williams], (CDRS) (1♀). Near to summit 4500ft, 5 II 1964, D. Q. Cavagnaro, (CAS) (3♂). Cabo Douglas, 21 VI 1995, L. R[oque] and C. C[auston], (CDRS) (3♂ and 2♀). Campamento Perez South Punta Espinoza, 15 VI 1995, L. R and C. C. (CDRS) (7♂ and 4♀). Cueva norte, 20 VI 1995, L. R and C. C. (CDRS) (4♂ and 2♀). North Side 300m, 12 I 2002, L. R and C. C. (CDRS) (1♀). Zona de vegetacion, 20 VI 1996, L. R. (CDRS) (4♂ and 3♀). FLOREANA: Charles, 10 X 1905, F X W, (CAS) (2♀); 23–31 V

1906, F X W, (CAS) (1♀); 1–4 VI 1906, FXW, (CAS) (2♂). Zona costera, 2 IV 1995, L. R and V. Cruz, (CDRS) (1♂). *Scalesia* forest, 4 III 1995, L. R and V. Cruz (CDRS) (12♂ and 4♀). Arid zone 130m, 4 III 1995, in *H. curassavicum* flowers (3♂); in *C. molle* flowers (1♂), L. R and V. Cruz (CDRS). Road to the highland, 4 III 1995, L. R and V. Cruz (CDRS) (3♂). Parte alta, 4 III 1995, L. R and V. Cruz (CDRS) (1♂). Cerro Alieri 340 m, 21 XII 1999, in *Linum cratericola* flowers, L. R, (CDRS) (1♂). ISABELA: Albemarle Banks Bay, 16 X 1906, F X W, (CAS) (2♂). Albemarle Tagus Cove, 22 III 1906, F X W, (CAS) (1♂). V[olean] S[ierra] N[egra] 1000 m, 1 III 1989, B. L (CNC) (1♀). V[olcan] W[olf], *Scalesia* forest 1700 m, 19 V 1996, L. R (CDRS) (4♂). V W, Upper arid zone, 1250 m, 20 IV 1996, L. R (CDRS) (13♂). Playa Tortuga Negra, 22 VI 1995, L. R, (CDRS) (5♂ and 7♀). PINTA: Playa Ibetson, 14 III 1992, B. L (CNC) (1♂ and 1♀); reared from leaves *R. minima*, 14 III 1992, B. L (CNC) (1♂). 400 m, 17 III 1992, B. L (CNC) (2♂). PINTA: Abingdon green zone, 10 IV 1906, F X W, (CAS) (1♀). PINZON: Summit & upper caldera areas, 7 II 1964, D. Q. Cavagnaro, (CAS) (1♂). SANTILACO: James bay low altitud, VIII 1932, M. Willows, (CAS) (1♂). SANTA CRUZ: Indefatigable, 8 VI 1932, M. Willows, (CAS) (4♂ and 1♀). Academy Bay CDRS, 5 II 1964, R. O. Schuster, (CAS) (1♂); 25 II 1964, D. Q. Cavagnaro and R. O. Schuster, (CAS) (1♂). Arid Zone, asociated to *Castela galapageia*, 19 I 1989, B. L (CNC) (2♀). Transition zone, 20 I 1989, B. L (CNC) (1♂). SAN CRISTOBAL: Chatam Sapho cove, 9 II 1906, F X W, (CAS) (1♂).

Hemiargus ramon (Dognin, 1887)

“Ramon’s Blue Butterfly”

(Figs. 4–6)

Lycæna ramon Dognin 1887:23.

Hemiargus ramon; Roque et al. 1997:29; Peck et al. 1998:227.

Diagnosis. FW = 8.2–11.6 mm. Resembles *L. parthasioides*, with which it flies, but *H. ramon* has two black dots in the VHW inner costal margin while *L. parthasioides* has none. Male: DW and DHW violet blue, the outer margins thinly bordered with white. Female: DW and DHW dark with only a touch of blue at the wing base.

Geographical distribution. Distributed on the western slopes of the Andes from northern Chile to the south of Ecuador. This species was listed by Peck et al. (1998) as introduced in the Archipelago. It has been reported from the Calápagos Islands of Baltra, Española, Floreana, Isabela, San Cristóbal, Santa Cruz and Santiago (Roque et al. 1998) and is here reported from Fernandina, Pinzón, Santa Fé, Seymour Norte and Rábida.

Natural history. Common from the low arid zones to the highest elevations. Roque et al. (1997) reported seven leguminous plants as host of the species (*Acacia macracantha* Willd., *S. tora*, *Neptunia plena* Benth., *P. atropurpureus*, *Prosopis juliflora* D.C., *Tephrosia decumbens* (Benth.), and one species of Cucurbitaceae: *Cucumis dipsaceus* Her. and one species of Oxalidaceae is reported here: *Oxalis dombeyi* A. St-Hil.

Flowers visited. Asteraceae: *Scalesia gordilloi* Hamann & Wium Anders., *S. pedunculata*; Boraginaceae: *T. rufo-sericeae*; Leguminosae: *T. decumbens*.

Flight period. Observed during all months of the

year, but is most common during the rainy season (January to April).

Material studied. (42♂ and 12♀). ECUADOR Galápagos. ESPAÑOLA: Bahía Manzanillo, 24 IV 1992, (1♂); 25 IV 1999 (1♂), B. Landry, (CNC). FERNANDINA: Campamento Perez south Punta Espinoza, 15 VI 1995, L. R[oque] and C. C[auston] (CDRS) (1♂ and 2♀); Cabo Douglas, 21 VI 1995, L. R and C. C., (CDRS) (1♂). Zona de vegetación, 20 VI 1998, L. R and C. C., (CDRS) (1♀). FLOREANA: Zona Costera, 2 IV 1995, L. R and V. C[ruz] (CDRS) (5♂ and 5♀). High arid zone 150m, 4 III 1995, L. R and V. C (CDRS) (5♂). Road to Highland, 4 III 1995, L. R and V. C. (CDRS) (10♂ and 3♀). Parte media, 4 III 1995, in *Heliotropium curassavicum* flowers, L. R and V. C., (CDRS) (5♂). ISABELA: V[olean] S[ierra] N[egra], 24 IV 1996, L. R (CDRS) (2♂ and 2♀). V S N, Las Mercedes 120m, 24 IV 1996, L. R (CDRS) (6♂ and 2♀). PINZON: Playa escondida, 20 VI 2002, L. R and B. L., (CDRS) (3♂ and 3♀). SANTA CRUZ: Arid Zone, 8 IX 1999, L. R and C. Covell (CDRS) (2♀ and 4♂); 19 I 1989, B. L., (CNC) (3♂ and 3♀).

NYMPHALIDAE

Danainae

Danaus gilippus thersippus (Bates 1863)

“Queen Butterfly”

(Fig. 11)

Papilio thersippus Bates 1863.

Danaus gilippus; Parkin et al. 1972:103; Linsley 1977:29.

Danaus gilippus thersippus; Ackery & Vane-Wright 1984:20S.

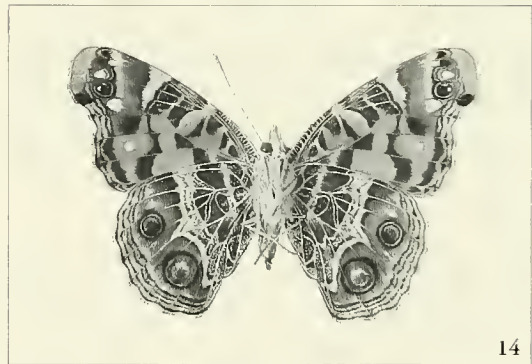
Diagnosis. FW = 36–41 mm. Easily distinguished from *D. plexippus* L. by not having the black inner border, and the black veins on the DFW. Males have a black androconial patch on the DHW. Females are similar to males but without an androconial patch.

Geographical distribution. *Danaus gilippus thersippus* is distributed from the Southern United States to Panamá and is native to the Calápagos Islands. The species has been reported from San Cristóbal (Parkin et al. 1972), and is here reported from Baltra, Floreana, Isabela, Santa Cruz, Santiago, Seymour Norte and Rábida.

Natural history. The queen butterfly is primarily an inhabitant of the arid zones from sea level to 400 m, but its distribution is limited by the occurrence of its foodplants. Adults have been observed flying slowly and frequently visiting flowers in open areas. The pale green eggs are laid singly on young and old leaves of the endemic vine *Sarcostenma angustissima* R. W. Holm. The other milkweed that occurs on the islands, *Asclepias curassavica* L., apparently is used as an alternative food plant.

Flowers visited. Asclepiadaceae: *A. curassavica*, *S. angustissima*; Asteraceae: *D. tenuifolius*; Boraginaceae: *H. angiospermum*; Solanaceae: *P. pubescens*; Verbenaceae: *L. camara*.

Flight period. All available records are from the rainy season.



FIGS. 9-16. 9, *Agraulis vanillae galapagensis* (DW); 10, *Agraulis vanillae galapagensis* (VW); 11, *Danaus gilippus thersippus* (DW); 12, *Danaus plexippus megalippe* (DW); 13, *Vanessa virginiensis* (DW); 14, *Vanessa virginiensis* (VW); 15, *Vanessa carye* (DW); 16, *Vanessa carye* (VW).

Remarks. Ackery and Vane-Wright (1984) suggested that this species could have been introduced from California to the islands in recent times. Based on its current distribution and the well-established dispersal potential, and taking into consideration the dates of discovery of the butterfly and its host plants, it is reasonable to assume that *D. g. thersippus* arrived in the Archipelago through natural dispersal mechanisms and was not introduced by humans.

Material studied. (23♂ and 9♀) ECUADOR, Galápagos. FERNANDINA: Cueva Norte, L. R[oque], (CDRS) (2♂ and 1♀). Campamento Perez south Punta Espinoza, 18 VI 1998, L. R and C. Causton, (CDRS) (1♂). FLOREANA: Cerro Pajas, 20 IV 1996, L. R (CDRS) (1♀). Arid zone, near to Black beach, 22 IV 1996, L. R (CDRS) (2♂). C. Cruz farm, 24 VI 1996, L. R (CDRS) (4♂). Asilo de la Paz 342m, 23 IV 1996, L. R (CDRS) (4♀ and 4♂). ISABELA: Playa Tortuga Negra, 22 IV 1998, L. R (CDRS) (8♂ and 3♀). Volcan Sierra Negra Alemania 350 m, 29 IV 1996, L. R. (CDRS) (10♂ and 6♀). Volcan Sierra Negra pampas, 24 IV 1996, L. R. (CDRS) (1♀). SAN CRISTÓBAL: Puerto Baquerizo, 17 II 1989, B. L. (CDRS) (1♂); (MECN) (1♂).

Danaus plexippus megalippe (Hübner, [1826])

“The Monarch”

(Fig. 12)

Anosia megalippe Hübner [1826]:2, pl. 7, fig. 2.

Danaus plexippus; Beebe 1923:55.

Danaus plexippus; Linsley & Usinger 1966:157; Roque 1998a:9, b:10.

Danaus plexippus megalippe; Ackery & Vane-Wright 1984:201.

Diagnosis. FW = 35–50 mm. This species is easily distinguished from *D. gilippus* by having the DFW apex boldly black, a black inner border in DFW and prominent black veins. Males have a black androconial patch on the DFW. Females are similar to males but much darker.

Geographical distribution. The Monarch is native in the Galápagos Islands and reported from Floreana, San Cristóbal and Santa Cruz. The status of this species has been discussed in some detail by Roque (1998a). *Danaus plexippus megalippe* is distributed from Nicaragua to Perú including the North east of Brazil, Venezuela, French Guiana, Surinam, Guyana, Trinidad, Tobago and some islands of the West Indies (Ackery & Vane-Wright 1984).

Natural history. Common in open areas such as fields, roadsides and disturbed sites. In general, the localities where the species occurs are mesic, but there are a few records in arid zones. Galápagos populations do not migrate. The adults fly slowly and visit flowers. Females have been observed ovipositing on the milkweeds *A. curassavica* and *S. angustissima*, but the latter is used as an alternative host plant.

Flowers visited. Asclepiadaceae: *A. curassavica*; Malvaceae: *H. rosa-sinensis*; Verbenaceae: *L. camara*, *V. litoralis*.

Flight period. Adults commonly occur only in the

rainy season, but are observed sometimes in the dry season.

Material studied. (13♂ and 5♀). ECUADOR, Galápagos. FLOREANA: Cerro Pajas, 20 IV 1996, L. R[oque], (CDRS) (1♂ and 1♀). Arid zone, near to Black beach, 22 IV 1996, L. R. (CDRS) (4♂ and 4♀). Finca de C. Cruz, 24 VI 1996, L. R (CDRS) (1♂). Asilo de la Paz 342 m, 23 IV 1996, L. R. (CDRS) (4♂). SAN CRISTÓBAL: Puerto Baquerizo, 17 II 1989, B. Landry (CDRS) (1♂); (CNC) (1♀); (MECN) (1♀). SANTA CRUZ: El cascajo, II 1999, L. R. (CDRS) (1♀). Salasaca, 22 VIII 2000, R. Oquendo, (CDRS) (1♂).

Heliconiinae

Agraulis vanillae galapagensis (Holland 1889)

“Galápagos Fritillary”

(Figs. 9, 10)

Agraulis vanillae galapagensis Holland 1889:194; Williams 1911:298; Beebe 1923:55; Van Duzee 1933:141.

Dione vanillae galapagensis; Stichel 1938:92; Michener 1942:4; Linsley & Usinger 1966:156.

Diagnosis. FW = 19–29 mm. This species is distinguished by its silver markings on the VW. The females are paler than males.

Geographical distribution. Endemic to the Galápagos Islands. It has been collected on Baltra, Edén, Fernandina, Floreana, Isabela, Pinta, San Cristóbal, Santa Cruz, and Santiago (Linsley & Usinger 1966).

Natural history. This is a common species on the larger Galápagos Islands. Adults have been observed in open areas and forests from sea level to the highlands. Beebe (1924) cited an interesting migration along the West Coast of Isabela Island. Adults usually fly slow, low to the ground and frequently have been seen visiting flowers. Williams (1911) mentioned species of the genus *Passiflora* L. as food plants of this fritillary in the Archipelago, but he did not mention which. Oviposition was observed on *Passiflora suberosa* L. and *Passiflora tridactylites* Hook. (Passifloraceae). The eggs were laid singly on young leaves. The larvae are black with green longitudinal stripes. The head and body are covered with long black spines.

Flowers visited. Acanthaceae: *Blechnum brownei* Juss. f., *J. galapagana*; Asclepiadaceae: *S. angustissima*; Boraginaceae: *Croton scouleri* Hook. f.; Cannaceae: *Commelina diffusa* Burdm. f.; Malvaceae: *S. hederifolia* Cav., *S. paniculata* L., *S. salviifolia* Presl.; Rubiaceae: *D. radula*; Rutaceae: *C. limon*; Sterculiaceae: *Waltheria ovata* Cav.; Verbenaceae: *L. camara*, *Stachytarpheta cayennensis* (Rich.) M.Vahl.

Flight period. All specimens were collected in the rainy season but individuals were observed during all months of the year except August and September.

Remarks. This species has been treated by several authors as a subspecies of the widely distributed American species *Agraulis vanillae*. Holland (1889) and Williams (1911) stated that the Galápagos taxon

should be raised to specific status based on several differences in the wing pattern. Michener (1942) recognized the differences in the wing maculation and size, and mentioned some variation in the male genital valvae. Specimens studied here were collected on several localities of the Archipelago. The male genitalia are generally similar to those of mainland specimens of *A. vanillae* but differ consistently in the valva. The apex of the valva is more slender and with fewer denticles in *A. v. galapagensis*. The female genitalia are similar in both forms. *Agraulis vanillae galapagensis* can be separated from the other described subspecies by the smaller size, by the darker and more fuscous color of the basal half of the wings dorsally, by the stronger black markings on the wings, and by the absence of white dots in the black spots of the DFW discal cell. The holotype, collected on Chatham [San Cristóbal], is deposited in the National Museum of Natural History, Washington, DC (USNM). The identity of this species will remain questionable until a revision of the genus makes it more definite.

Material studied. (14♂ and 51♀). ECUADOR, Galápagos. FERNANDINA: Campamento Perez south Punta Espinoza, 18 VI 1998, L. R[oque] and C. Causton, (CDRS) (1♂). FLOREANA: Arid zone 130m, 17 IV 1996, L. R., (CDRS) (1♂). Cerro Pajas, *Scalesia* forest, 18 IV 1996, (9♂ and 5♀); 19 IV 1996, L. R., (1♀); 22 IV 1996, L. R. (CDRS) (7♂ and 2♀). ISABELA: V[oleán] S[ierra] N[egra], Santo Tomás, 6 IV 1996, (1♂); 26 IV 1996, L. R., (CDRS) (1♂). V S N, bosque de los niños, 20 III 1995, L. R., (CDRS) (1♂). V S N, pampas 1000m, 1 III 1989, B. L[andry] (CNC) (1♀). V S N, la bocanilla 1000m, 28 IV 1996, L. R., (CDRS) (2♂ and 1♀). V S N, Las merceditas, 30 IV 1996, L. R., (CDRS) (2♂ and 4♀). Volcan Wolf, upper arid zone 1700 m, 19 V 1996, L. R., (CDRS) (13♂ and 4♀). PINTA: 400 m, 17 III 1992, B. L., (CNC) (4♂). SANTIAGO: Playa Espumilla, 4 IV 1992, B. L., (CNC) (1♂). SANTA CRUZ: CDRS, 22 XI 1963, (CDRS) (1♂). Tortugas reserve west of Santa Rosa, 6 II 1989, B. L., (CDRS) (1♂); (MECN) (1♂).

Nymphalinae

Vanessa virginiensis (Drury 1773)

"Painted Lady"

(Figs. 13, 14)

Nymphalis cardui virginiensis Drury 1773:1.

Pyrameis huntera; Williams 1911:299.

Vanessa virginiensis; Linsley & Usinger 1966:156.

Diagnosis. FW = 21.7–29 mm. Differs from *V. carye* by the presence of two blue-centered ocular markings on the VHW. Males and females are similar.

Geographical distribution. This cosmopolitan species was previously reported from Isabela (Volcanoes Darwin and Sierra Negra) (Williams 1911). On Isabela, the species was found at those localities as well as on volcanoes Alcedo, Cerro Azul and Wolf. Other new records include Santa Cruz and Santiago and it probably also inhabits other large islands. The species is distributed from southern Canada to the mountainous region of Colombia, including the West

Indies, Hawaii, Azores, Madeira, the Canary Islands, and occasionally Europe (DeVries 1987).

Natural history. This species has only been observed in the open grassy areas of the highlands. All specimens were collected above 900 m in the pampa zone. Although it flies usually under bright and sunny conditions, we have seen it under overcast conditions and even during light rain (Volcán Alcedo, 23.X.1995). Adults fly fast and rest on the ground, flying short distances when disturbed. Eggs, larvae and pupae were found on the leaves of *Gnaphalium purpureum* L. (Asteraceae) on the islands of Isabela and Santiago. The plant can be found on more islands (Lawesson et al. 1987). *Vanessa virginiensis* has resident populations in the Galápagos Islands.

Flowers visited. Rubiaceae: *Borreria laevis* (Lam.) Griseb.

Flight period. Specimens have been collected or observed from January to June.

Material studied. (15♂ and 4♀). ISABELA: Albemarle, 20–31 VIII 1906, F X Williams, (CAS) (1♂). V[oleán] S[ierra] N[egra], rim northwest side, 4 III 1989, B. L[andry], (CDRS) (1♂); (MECN) (1♂). V S N, 1000 m, 4 III 1989, S. B. Peck (CNC) (1♀). V S N, La Bocanilla 1000 m, 28 IV 1996, L. R[oque], (CDRS) (1♂ and 4♀). V S N, Las Merceditas, 6 IV 1996, L. R., (CDRS) (1♂). Volcán Wolf, high arid zone, 1250 m, 21 V 1996, L. R., (CDRS) (4♂). Volcan Alcedo, top 1100 m, 24 IV 1998, L. R. (2♂ and 4♀). SANTA CRUZ: CDRS, 10 VI 1965, (CDRS) (1♂). SANTIAGO: Los Jaboncillos 900 m, 9 IV 1992, B. L., (CNC) (1♀); 16 III 1998, L. R., (CDRS) (1♂). Los Aguacates, 16 III 1998, L. R. (CDRS) (1♂). NW slope 600 m, 30 V 1964. D. Q. Cavagnaro, (CAS) (1♀).

Vanessa carye Hübner [1812]

"Western Painted Lady"

(Figs. 15, 16)

Hamadryas carye Hübner [1812]:pl. 45, figs. 1, 2.

Pyrameis caryae; Williams 1911:300.

Vanessa caryae; Linsley & Usinger 1966:156.

Diagnosis. FW = 21–28 mm. Differs from *V. virginiensis* by having four small blue-centered ocular markings on the VHW.

Geographical distribution. This species has been collected on San Cristóbal, Fernandina, and recently observed by the author in Floreana. *Vanessa carye* is distributed in the Andes of Colombia, Ecuador, Peru, Bolivia, Chile, southwestern Brazil, Paraguay, Uruguay, and Argentina. It also occurs on Juan Fernandez island, on Easter island, and the Tuamotu Archipelago.

Natural history. Three out of four specimens collected or observed were from the low arid zone at sea level. Two fresh adults were observed visiting flowers on Floreana (13 I 1995 and 6 II 1995, Puerto Velazco Ibarra) but were not collected. Their fresh condition suggested that they were from a population extant on the island, rather than migrants. The host plant and the immature stages are unknown in the Archipelago.

Members of Asteraceae, Geraniaceae, Malvaceae, and Urticaceae are reported as host plants for the species (Field 1971).

Flowers visited. Verbenaceae: *C. molle*.

Flight period. Adults have been collected or observed in January and February.

Remarks. The only two specimens collected on the Galápagos were deposited in the California Academy of Sciences.

Material studied. (1♂ and 1♀). FERNANDINA: near to summit, 4800 ft, 5 II 1964, D. Q. Cavagnaro. (CAS) (1♀). SAN CRISTOBAL: Chatam, Wreck Bay, 22 II 1906, (CAS) (1♂).

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